The BLUE D●TS initiative

Elements for a roadmap

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for the Blue Dots team

Objectives of the initiative

- Contribute to building a community in Europe around the exoplanets theme

- Recognizing that the ultimate science goal (characterization of habitable exoplanet atmospheres) will require several intermediate steps…

- …converge towards a strategy enabling a more coherent approach to calls for proposals in ground and space based projects...

- ...and most notably in time for the next CfP ESA linked to Cosmic Vision (expected in 2010)

- Beyond that: remain as a permanent structure to federate the community

Deliverables Blue Dots Timeline

- Web site + intranet for information circulation
- Preliminary report to CNES february 2009
- Report v1 end March 2009
  - Call for feedback in the community
- Report stabilized by summer 2009
- Sep. 2009: Pathways conference (proceedings)
- 2010: structuration into European network (TBC)

http://www.blue-dots.net
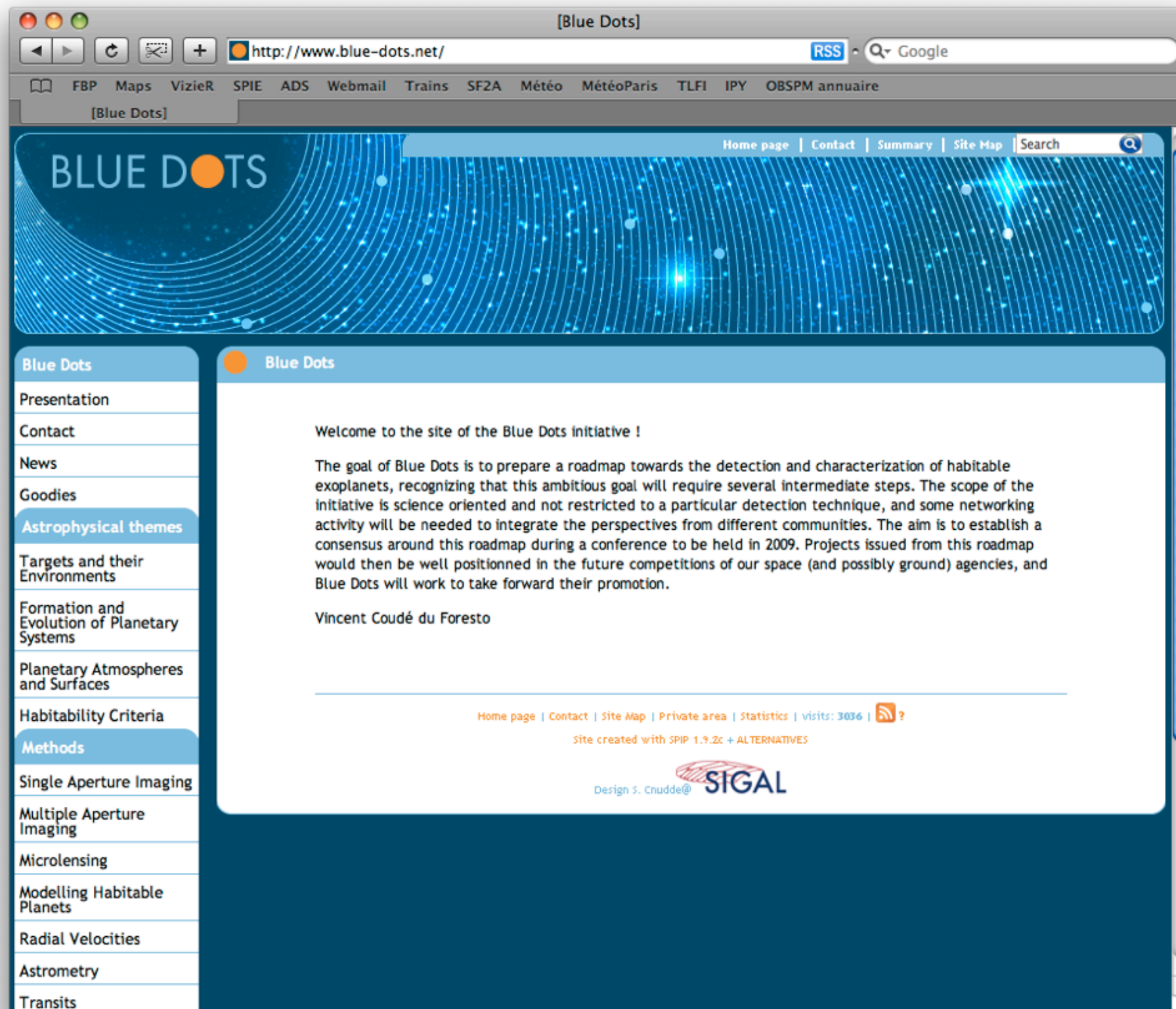
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Methodology prospective
Setting a frame, grammar for roadmap elaboration

What do we want to know ?

- For each astrophysical theme :
  - Establish prioritized list of key science questions
  - Physical facts needed to answer those key questions

What can we do ?

- For each instrumentation theme:
  - Establish evolution of the quantity, quality of observables as a function of mission size

Then…

  - Compile this information in homogeneous tables
  - The synthesis of these tables will help prepare the roadmap

And also …

- Tap into existing information
  - Expertise within WGs
  - Input from existing white papers
  - Proactive external collection when needed
  - Spontaneous external contributions always possible

- Clearly separate matters of consensus from matters of debate

- Deliberately introduce specific missions at a later stage of the prospective

What do we want to know ?

- Habitability criteria
- Planetary atmospheres & surfaces
- Formation & evolution of planetary systems
- Targets & their environments

What do we want to know ?

- Habitability criteria
- Planetary atmospheres & surfaces
- Formation & evolution of planetary systems
- **Targets & their environments**
  - *What are the physical properties (including mass and age) of the target stars?*
  - *What are the radiative properties (light and particles, T_{eff}, L_{bol}) of the target stars?*
  - *What is the time-variation of such emissions ?*
  - *What are the characteristics of the stellar immediate surroundings (i.e., zodiacal dust, companion stars, brown dwarfs or giant planets)?*
  - *What are the stellar properties (mass, chemical composition) influencing the existence of telluric planets?*

What can we do

- A step by step approach:
  - **1** – Statistical study of planetary objects
  - **2** – Designate sources suitable for spectroscopic follow-up
  - **3** – Carry out spectroscopic characterization

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These define different science potential levels which can be achieved on different object classes => different difficulties

Methods and scales

- Methods:
  - RV: Radial Velocities
  - μlensing
  - Transit photometry
  - Single Aperture Imaging
  - Multiple Aperture Imaging
  - Astrometry
  - *Modelling planetary structures & atmospheres*

Methods and scales

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- Scales:
  - E (existing)
  - G (30M€, 5 years)
  - M (450M€, 10 years)
  - L (650M€, 15 years)
  - XL (> 1G€, > 20 years)

Science potential level
Methods and scales

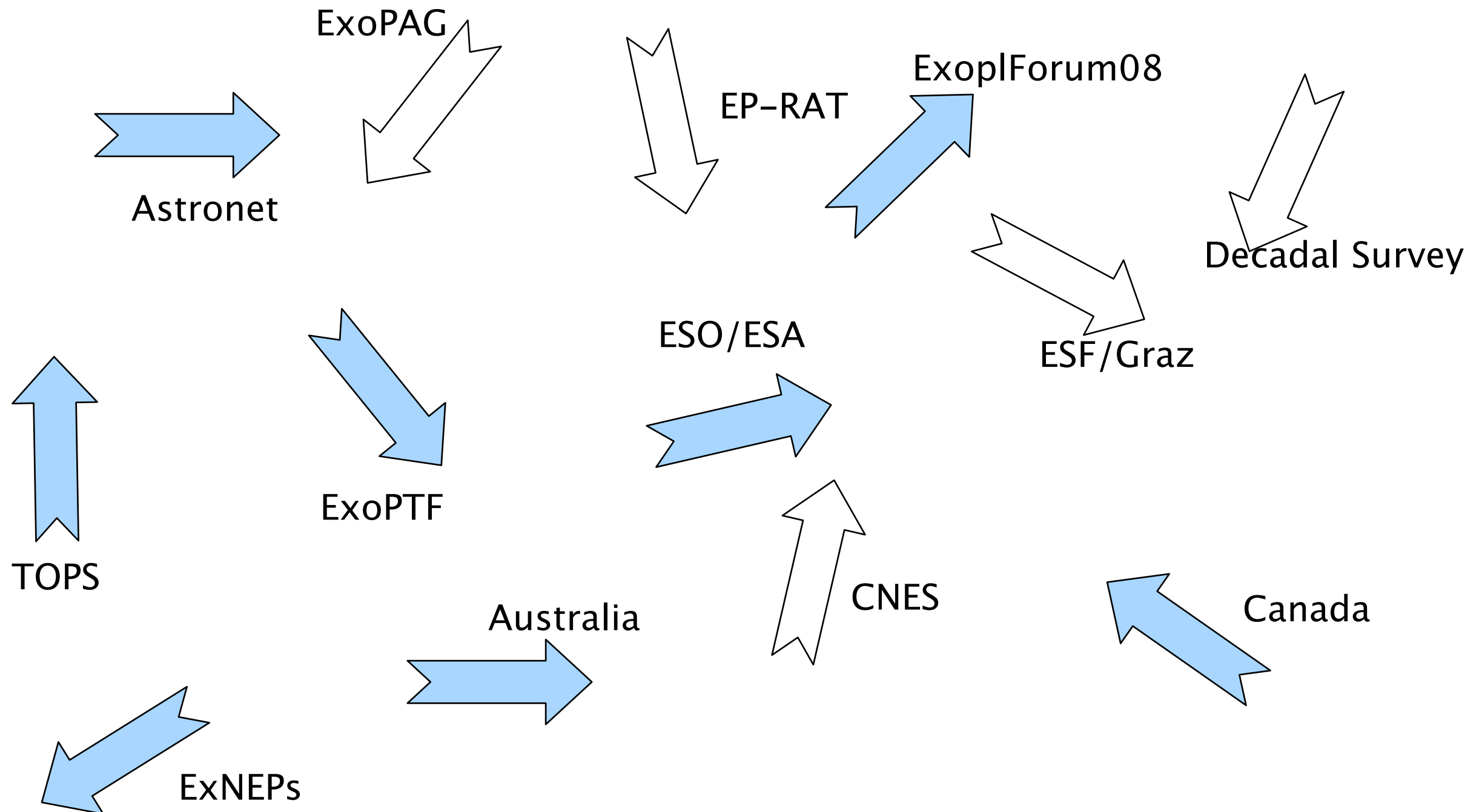|	1	2	3	4	5
	Giant (close / young)	Giants (others)	Telluric (others)	Telluric HZ (M)	Telluric HZ (others)
Astrometry	2	2	2		2
MAI	3		3	3	3
SAI	3	3		3	3
Transit	3	2 ?	3 ?	3	1
μlensing		1	1	1	1
RV	2	2	2	2	2

- Cornerstone questions:
  - Can telluric habitable planets be identified from the ground by RV ?
  - Should we search for habitable planets around M stars ?
  - Is spectroscopic characterization of the atmosphere of telluric exoplanets possible by transit spectroscopy ?
  - Do we need to solve the exozodi issue ? If yes, how best to solve it ?

Timeline methods

	SPL	Existing	G	M	L - XL
Astrometry	2		Giants (far)		Telluric
MAI	3		Hot giants		All others
SAI	3	Young giants	Giants (far)		Telluric
Transit	2 - 3 ?	Close giants		All others	
μlensing	1	Giants		Habitable telluric	
RV	2	Giants, telluric	Habitable telluric		

- Cornerstone questions:
  - Do we need precursors to large flagship missions ?
  - How relevant will be, when it flies, a large flagship mission defined now ?
  - Are institutional structures compatible with an ambitious exoplanetary program ?

Exoplanet roadmaps…

ExoPAG

ExopIForum08

Astronet

EP–RAT

Decadal Survey

ESO/ESA

ESF/Graz

ExoPTF

TOPS

CNES

Canada

Australia

ExNEPs

Courtesy J. Schneider

http://www.pathways2009.net

Opportunity for satellite meetings

- Benefit from the full exposure and logistics of the Pathways conference

- Extra sessions in late afternoon

- Deadline for proposals May 20th

- See http://www.pathways2009.net/satellite.html for details